



Plastic Entanglement

A very dear friend of mine said recently, when we were talking about our entry in the [Plastic Diet](#) challenge: which is the near impossible yet necessary month of the year that we feel extra guilty of our normal ways and what stuff we insistently keep buying in supermarkets - how used we've gotten to having everything so easily wrapped up for us, she said: "I work in sustainability, I work really hard for it, I exercise while having physical complaints, I go to a therapist for my youth trauma's, I cycle to work everyday through increasing wind and rainfall, but it is so goddamn hard to eat healthy and live a plastic free life, I am giving up, I will take for granted that I will start shitting plastics."

And she is right.

We do actually shit plastics.

It has been proven by now we all - yes you and me - carry a few milligrams of plastics in our stomachs, permanently; indigestible matter, in every way we look at it. Plastics have become a hobby that got out of hand, and the problems increase due to an indestructible lobby led by large corporations and industry.

Of course, numbers. In 1950 we produced as much as 2 million tonnes plastics a year, which is now around 350 million tonnes, which will triple according to experts around the year 2050. In between 1950 and 2050, we have collectively produced around 8 billion tonnes, and not more than 9% of it has been recycled, next to a few percentages of incineration, landfill, and of what is still in use. The larger part of all that produced plastic (~5 billion tonnes), could, according to [the Economist](#) be fitted in a landfill the size of Manhattan, around 57 km² and 70 meters deep. But, that is of course not where it is. It can be found anywhere on every corner of the street, in the ocean, it is slowly replacing grains of sand in Marokko; we will later most likely look back at our time and name this the Plastic Age. As it is already slowly becoming part of our mountains and sea bed rock formations, coral reefs, etc.

The real issue with plastic waste is - as hopefully many of you already know - are the microplastics, microbeads or microfibers, this could be described as a consequence of material degradation when a large chunk of plastic slowly crumbles due to time wind water and weather, it will end up as a very tiny piece of indigestible material that is unseeable for the human eye without a microscope. Fish and other animals though, will mistake it as food, and eat it as they would do plankton. Not only through material degradation, but also witty innovation causes microbeads in our system; your hair simply washes more perfectly when scub-balls are added to your shampoo





to simply wash away in our water systems, or maybe a little less intentional when the clothes you wear (i.e. fleece or polyester) rub off microfibers when walking, but especially when you put them in the washing machine. Most plastics, can last somewhat around [500 years](#) before actually disintegrating.

So, we eat fish, and drink the water, and thus we are unwillingly eating away plastics to slowly start realizing what the consequences could be. In the meantime, microscopic parts can be found in most types of [honey](#) (actually a consequence of flowers that hydrate ground soil through their stems, discarding the plastics at the flower where our beloved honeybees are picking it up, see a Dutch episode of [Keuringsdienst van Waarde](#)), plastics are found in sugars, in [shellfish](#) such as mussels, furthermore according to a study where they tested tap water in 7 different world-regions, [83% of the samples contained plastic fibers](#) (72% in Europe), next to that, [90% of all tested bottled waters](#) of 11 different large brands contained on average 10 particles per bottle. So, it is found in processed foods, table salt, soft drinks, and, wait for it: most beers. [Scottish researchers](#) even found that we ingest even more plastics per saldo due to fine dust, household fine dust to be exact, mostly due to the polyester clothing we are wearing.

And now the scary part starts, plastics have been linked to all kinds of health risks, the eerie feeling that this material made from crude oil should be damaging to health and environment, is closer than you may think.

Because of the molecule structure of some types of plastic, even our bodies get confused, confusing the molecule with estrogen. The result? Our [penisses are getting smaller](#), and girls are having their first period as [early as age 5](#).

As for the environment, some of you may know that underneath the polar caps lay lakes of methane gas, a very powerful and harmful gas that will significantly increase the climate change effects when these ice caps melt; the now trapped methane will evaporate into our atmosphere making global warming pretty much unstoppable. But, now [a researcher found](#), by accident actually, that these same or similar gasses also evaporate out of plastics that lay exposed to the sun, and that the amount of gas per square meter that evaporates is *higher* in plastics compared to that what lays underneath our polar caps. We have, we could say, created a monster.

The Myth of Innovation

There are indeed fantastic worldwide innovations that are trying to actually do something about this pressing issue of plastic waste. Things I have encountered or that I even contributed to are in my view all about one thing: revaluing plastic waste into a valuable product, most value is of course added in the product-design-stage where we have moulded the material into shape to be able to market it. This way we





can already build complete houses out of plastics, we can make bricks, transparent windows, roof tiles, curtains or even ink for 3D printers - all products have a quality comparable to when they would have been made from virgin, or newly made plastics, but they are all from recycled plastic waste streams.

Plastics as a general principle, like paper, can be mechanically recycled around 7 times, mechanically recycled meaning chopping it into small pieces and heating and melting it. Microscopically what makes plastic plastic, is that long chains of polymers are tangled up in and around each other, similar to what happens to your in-ear headphone cables, which gives plastic some of its properties. When we recycle the plastics, these long chains of polymers will shorten each time you need to heat it up, and after around 7 times the chains are shortened that far that only a dubious substance will remain, having zero to none properties to work with. Technically, mechanically, there is a lot possible already, and the technical processes are actually very simple, shredding and heating, and compared to producing virgin plastics these recycle processes even need a lot less energy and will excrete a lot less CO2. The only thing is, the process is more complicated and therefore more expensive - resulting in the utter fact that a Kg of recycled granules of plastics of the same quality is more expensive than the same amount of virgin plastics.

To properly recycle plastics to the highest quality possible - or actually any material in a broader sense - we need monostreams, meaning a waste stream of a single type of plastic. The thing is, when multiple types of plastics are melted together, what happens on microscopic level is that these different polymer chains do not end up entangled, they kind of reject each other, even when two different types of plastics have the same melting temperature, this will happen. Mixing plastics together is possible however, but you need to add glue to keep them together and the properties of the resulting product are far from homogeneous - or - you can not depend on certain quality or properties; products though can be made when a right market fit is found, for instance the famous roadside posts are made from this. But here comes an important note, we have already exceeded producing and designing 400 different types of plastic, all specifically designed to solve certain problems like hardness or flexibility, food shelf life, etc. And this number is only increasing. Monostreams are as a consequence not always easy to get by or can be impure, as the separation of different plastics in monostreams is unfortunately not an easy task.

Luckily there are however most common types of plastics available, the main plastic waste streams, or the biggest problem so to say. These are mainly from bottles, food packaging and bags, and I would say these need to get back into our material cycle before ending up anywhere else.

There is however a relatively unknown way of recycling as opposed to the mechanical process, which will never be able to deliver a fully circular material due to the shortening of the polymer chains. Chemical recycling is able to reach 100%





recycle rates, here polymer chains will get untangled in a chemical bath, until it reaches a monomer, or a single strand of a polymer, when these monomers are then retangled, you get a 100% of the original polymer. Chemical recycling is a proven technology and I think the only real answer to close material loops locally.

So why do we not already do all this?

It is a simple cost calculation. As processes to recollect household waste to sorting factory to recycler are more expensive, recycled plastic is more expensive. And when a bottle will cost a few cents more each time and you produce billions of it, you will definitely see it on your yearly bill. Big corporates simply do not want this, especially shareholders are not amused. So they regularly flee into technical innovation by way of saying to be working on the problem, as opposed to actually work on the problem. Our legendary statiegeld system (you pay for the bottle and you get money back when you hand it back in the supermarket), which is partly obligatory funded by these corporations, has been held back on many occasions and governmental negotiations due to a strong lobby against this system, the statiegeld system even almost fell completely this year. And this is a system only for Liter bottles, we do not even mention the fact of smaller bottles or plastic bags that you pay the municipality for to get processed.

But still, recycling in general should actually be the last resort, we should really start refusing plastic in general, and [drastically reduce](#) the amount of plastic that we think we need. One by one, multinationals are stating they will make most of their products out of recycled plastic content, most of the time by 2050, and most of the time without an actual plan of attack. So they seemingly remain empty statements. Furthermore, focussing on producing recycled single-use products, is not in any way countering the deeper issue that they will end up in the ocean anyway. We are then obliged to keep clinging on to innovative solutions such as Ocean Cleanup, allowing this massive overproduce to keep continuing, or as the Dutch say: mopping the floor while the water tap remains open. This really needs to change, we need to intervene, now. We cannot let this happen without any consequence, and I really believe it is the job of policy and lawmakers to start to make this change happen. And I want to state that it is actually possible: in 1970 we banned harmful gases because they were causing the well known hole in the ozone layer, and by now - this hole is actually gone, and industry still thrived.

Ownership

The solution to this huge issue is one thing only: make corporates become owners of their material. The processing bill should be send to the ones who choose to produce it, and not the consumer who has to pay to get rid of it. A consumer wants to buy the drink, or that piece of food, you want to buy the actual content. The choice for





packaging is made by the corporate, and should therefore also be a problem of the corporate. By shifting ownership of the packaging to the corporate you will force a company to think up actual witty innovation to reduce costs when collecting it and processing it. This way recycling should scale up faster, thus will get cheaper faster, and recycled content may even end up below the price of virgin plastics. Hopefully we then stop having to rely on [plastic-eating sea worms](#) that sprout into existence, but can actually start solving our self inflicted problem.

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